

TITLE: SEMICONDUCTOR BGA PACKAGE HAVING A  
SEGMENTED VOLTAGE PLANE AND METHOD OF MAKING

Inventor: Morrison et al.  
Serial No.: To Be Assigned  
Docket No.: 2269-6103US

1/4

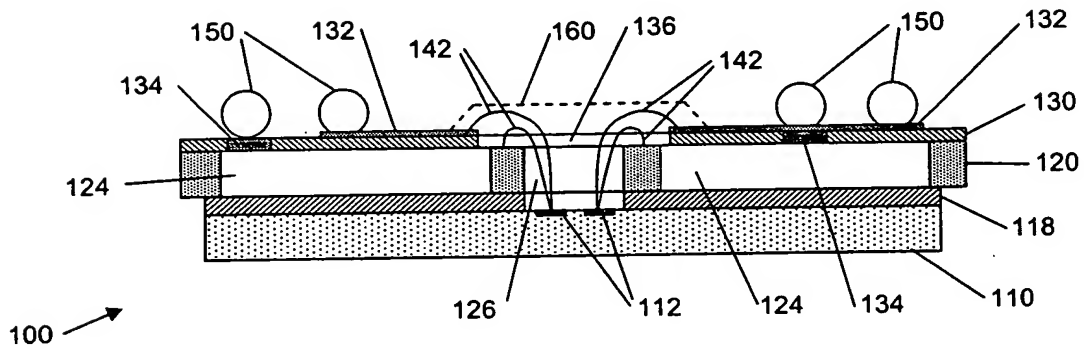


FIG. 1

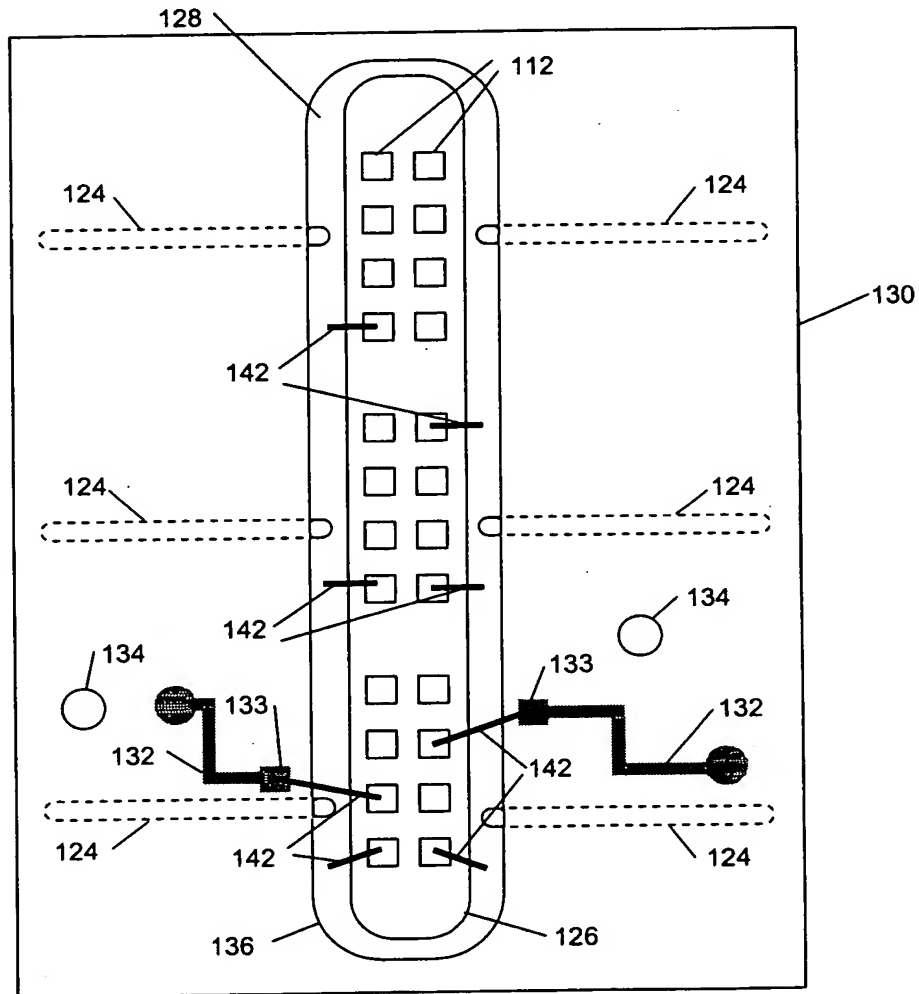


FIG. 2

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2/4

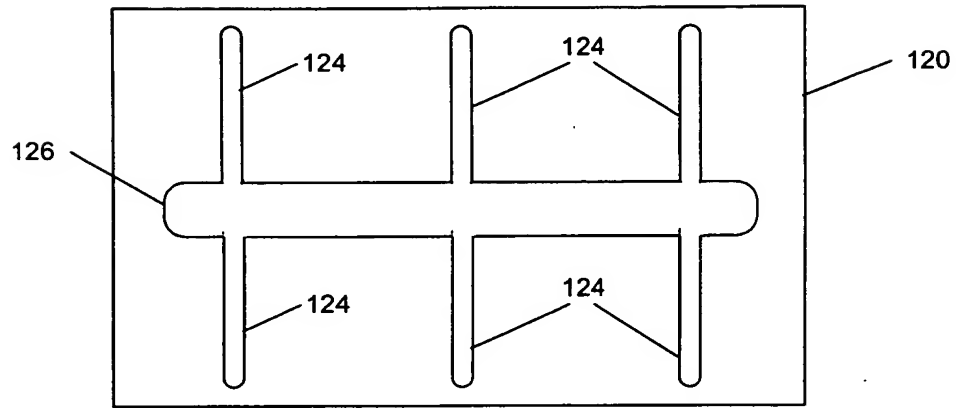


FIG. 3A

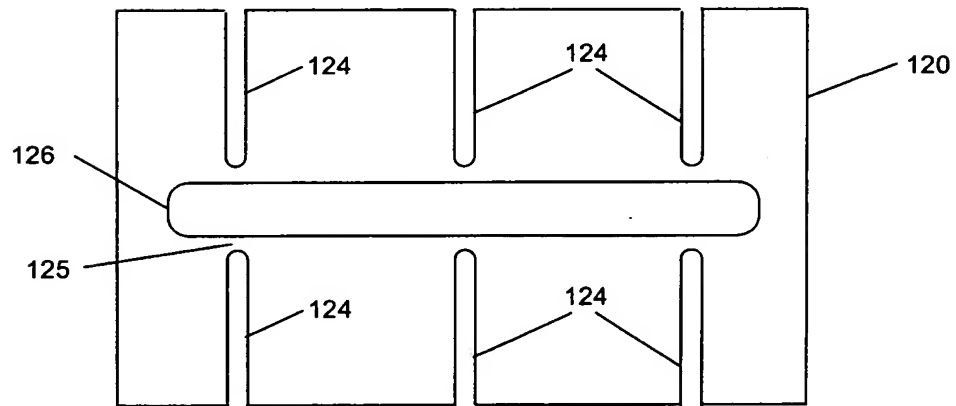


FIG. 3B

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FIG. 1 is a cross-sectional view of a multi-layered structure 139. The structure consists of a central white rectangular region 130, flanked by two identical multi-layered sections 132 and 132'. Each section 132/132' includes a top layer 130', a middle layer 132', and a bottom layer 130'. The entire assembly is bounded by layers 134 and 136. A central layer 138 is also indicated.

A cross-sectional view of a semiconductor device. The device consists of a substrate 110 with a top surface 112 and a bottom surface 118. A first layer 120 is formed on the top surface 112. A second layer 130 is formed on the first layer 120. A third layer 134 is formed on the second layer 130. A fourth layer 150 is formed on the third layer 134. A fifth layer 142 is formed on the fourth layer 150. A sixth layer 132 is formed on the fifth layer 142. A seventh layer 150 is formed on the sixth layer 132. A eighth layer 142 is formed on the seventh layer 150. A ninth layer 132 is formed on the eighth layer 142. A tenth layer 150 is formed on the ninth layer 132. A eleventh layer 142 is formed on the tenth layer 150. A twelfth layer 132 is formed on the eleventh layer 142. A thirteenth layer 150 is formed on the twelfth layer 132. A fourteenth layer 142 is formed on the thirteenth layer 150. A fifteenth layer 132 is formed on the fourteenth layer 142. A sixteenth layer 150 is formed on the fifteenth layer 132. A seventeenth layer 142 is formed on the sixteenth layer 150. An eighteenth layer 132 is formed on the seventeenth layer 142. A nineteenth layer 150 is formed on the eighteenth layer 132. A twentieth layer 142 is formed on the nineteenth layer 150. A twenty-first layer 132 is formed on the twentieth layer 142. A twenty-second layer 150 is formed on the twenty-first layer 132. A twenty-third layer 142 is formed on the twenty-second layer 150. A twenty-fourth layer 132 is formed on the twenty-third layer 142. A twenty-fifth layer 150 is formed on the twenty-fourth layer 132. A twenty-sixth layer 142 is formed on the twenty-fifth layer 150. A twenty-seventh layer 132 is formed on the twenty-sixth layer 142. A twenty-eighth layer 150 is formed on the twenty-seventh layer 132. A twenty-ninth layer 142 is formed on the twenty-eighth layer 150. A thirtieth layer 132 is formed on the twenty-ninth layer 142. A thirty-first layer 150 is formed on the thirtieth layer 132. A thirty-second layer 142 is formed on the thirty-first layer 150. A thirty-third layer 132 is formed on the thirty-second layer 142. A thirty-fourth layer 150 is formed on the thirty-third layer 132. A thirty-fifth layer 142 is formed on the thirty-fourth layer 150. A thirty-sixth layer 132 is formed on the thirty-fifth layer 142. A thirty-seventh layer 150 is formed on the thirty-sixth layer 132. A thirty-eighth layer 142 is formed on the thirty-seventh layer 150. A thirty-ninth layer 132 is formed on the thirty-eighth layer 142. A fortieth layer 150 is formed on the thirty-ninth layer 132. A forty-first layer 142 is formed on the fortieth layer 150. A forty-second layer 132 is formed on the forty-first layer 142. A forty-third layer 150 is formed on the forty-second layer 132. A forty-fourth layer 142 is formed on the forty-third layer 150. A forty-fifth layer 132 is formed on the forty-fourth layer 142. A forty-sixth layer 150 is formed on the forty-fifth layer 132. A forty-seventh layer 142 is formed on the forty-sixth layer 150. A forty-eighth layer 132 is formed on the forty-seventh layer 142. A forty-ninth layer 150 is formed on the forty-eighth layer 132. A fiftieth layer 142 is formed on the forty-ninth layer 150. A fifty-first layer 132 is formed on the fifty-first layer 142. A fifty-second layer 150 is formed on the fifty-first layer 132. A fifty-third layer 142 is formed on the fifty-second layer 150. A fifty-fourth layer 132 is formed on the fifty-third layer 142. A fifty-fifth layer 150 is formed on the fifty-fourth layer 132. A fifty-sixth layer 142 is formed on the fifty-fifth layer 150. A fifty-seventh layer 132 is formed on the fifty-sixth layer 142. A fifty-eighth layer 150 is formed on the fifty-seventh layer 132. A fifty-ninth layer 142 is formed on the fifty-eighth layer 150. A sixtieth layer 132 is formed on the fifty-ninth layer 142. A sixty-first layer 150 is formed on the sixtieth layer 132. A sixty-second layer 142 is formed on the sixty-first layer 150. A sixty-third layer 132 is formed on the sixty-second layer 142. A sixty-fourth layer 150 is formed on the sixty-third layer 132. A sixty-fifth layer 142 is formed on the sixty-fourth layer 150. A sixty-sixth layer 132 is formed on the sixty-fifth layer 142. A sixty-seventh layer 150 is formed on the sixty-sixth layer 132. A sixty-eighth layer 142 is formed on the sixty-seventh layer 150. A sixty-ninth layer 132 is formed on the sixty-eighth layer 142. A seventieth layer 150 is formed on the sixty-ninth layer 132. A seventy-first layer 142 is formed on the seventieth layer 150. A seventy-second layer 132 is formed on the seventy-first layer 142. A seventy-third layer 150 is formed on the seventy-second layer 132. A seventy-fourth layer 142 is formed on the seventy-third layer 150. A seventy-fifth layer 132 is formed on the seventy-fourth layer 142. A seventy-sixth layer 150 is formed on the seventy-fifth layer 132. A seventy-seventh layer 142 is formed on the seventy-sixth layer 150. A seventy-eighth layer 132 is formed on the seventy-seventh layer 142. A seventy-ninth layer 150 is formed on the seventy-eighth layer 132. An eightieth layer 142 is formed on the seventy-ninth layer 150. An eighty-first layer 132 is formed on the eighty-first layer 142. An eighty-second layer 150 is formed on the eighty-first layer 132. An eighty-third layer 142 is formed on the eighty-second layer 150. An eighty-fourth layer 132 is formed on the eighty-third layer 142. An eighty-fifth layer 150 is formed on the eighty-fourth layer 132. An eighty-sixth layer 142 is formed on the eighty-fifth layer 150. An eighty-seventh layer 132 is formed on the eighty-sixth layer 142. An eighty-eighth layer 150 is formed on the eighty-seventh layer 132. An eighty-ninth layer 142 is formed on the eighty-eighth layer 150. A ninetieth layer 132 is formed on the eighty-ninth layer 142. A ninety-first layer 150 is formed on the ninetieth layer 132. A ninety-second layer 142 is formed on the ninety-first layer 150. A ninety-third layer 132 is formed on the ninety-second layer 142. A ninety-fourth layer 150 is formed on the ninety-third layer 132. A ninety-fifth layer 142 is formed on the ninety-fourth layer 150. A ninety-sixth layer 132 is formed on the ninety-fifth layer 142. A ninety-seventh layer 150 is formed on the ninety-sixth layer 132. A ninety-eighth layer 142 is formed on the ninety-seventh layer 150. A ninety-ninth layer 132 is formed on the ninety-eighth layer 142. A hundredth layer 150 is formed on the ninety-ninth layer 132. A hundred-first layer 142 is formed on the hundredth layer 150. A hundred-second layer 132 is formed on the hundred-first layer 142. A hundred-third layer 150 is formed on the hundred-second layer 132. A hundred-fourth layer 142 is formed on the hundred-third layer 150. A hundred-fifth layer 132 is formed on the hundred-fifth layer 142. A hundred-sixth layer 150 is formed on the hundred-sixth layer 132. A hundred-seventh layer 142 is formed on the hundred-seventh layer 150. A hundred-eighth layer 132 is formed on the hundred-eighth layer 142. A hundred-ninth layer 150 is formed on the hundred-ninth layer 132. A hundred-tenth layer 142 is formed on the hundred-tenth layer 150. A hundred-eleventh layer 132 is formed on the hundred-eleventh layer 142. A hundred-twelfth layer 150 is formed on the hundred-twelfth layer 132. A hundred-thirteenth layer 142 is formed on the hundred-thirteenth layer 150. A hundred-fourteenth layer 132 is formed on the hundred-fourteenth layer 142. A hundred-fifteenth layer 150 is formed on the hundred-fifteenth layer 132. A hundred-sixteenth layer 142 is formed on the hundred-sixteenth layer 150. A hundred-seventeenth layer 132 is formed on the hundred-seventeenth layer 142. A hundred-eighteenth layer 150 is formed on the hundred-eighteenth layer 132. A hundred-nineteenth layer 142 is formed on the hundred-nineteenth layer 150. A hundred-twentieth layer 132 is formed on the hundred-twentieth layer 142. A hundred-twenty-first layer 150 is formed on the hundred-twenty-first layer 132. A hundred-twenty-second layer 142 is formed on the hundred-twenty-second layer 150. A hundred-twenty-third layer 132 is formed on the hundred-twenty-third layer 142. A hundred-twenty-fourth layer 150 is formed on the hundred-twenty-fourth layer 132. A hundred-twenty-fifth layer 142 is formed on the hundred-twenty-fifth layer 150. A hundred-twenty-sixth layer 132 is formed on the hundred-twenty-sixth layer 142. A hundred-twenty-seventh layer 150 is formed on the hundred-twenty-seventh layer 132. A hundred-twenty-eighth layer 142 is formed on the hundred-twenty-eighth layer 150. A hundred-twenty-ninth layer 132 is formed on the hundred-twenty-ninth layer 142. A hundred-thirtieth layer 150 is formed on the hundred-thirtieth layer 132. A hundred-thirty-first layer 142 is formed on the hundred-thirty-first layer 150. A hundred-thirty-second layer 132 is formed on the hundred-thirty-second layer 142. A hundred-thirty-third layer 150 is formed on the hundred-thirty-third layer 132. A hundred-thirty-fourth layer 142 is formed on the hundred-thirty-fourth layer 150. A hundred-thirty-fifth layer 132 is formed on the hundred-thirty-fifth layer 142. A hundred-thirty-sixth layer 150 is formed on the hundred-thirty-sixth layer 132. A hundred-thirty-seventh layer 142 is formed on the hundred-thirty-seventh layer 150. A hundred-thirty-eighth layer 132 is formed on the hundred-thirty-eighth layer 142. A hundred-thirty-ninth layer 150 is formed on the hundred-thirty-ninth layer 132. A hundred-fortieth layer 142 is formed on the hundred-fortieth layer 150. A hundred-forty-first layer 132 is formed on the hundred-forty-first layer 142. A hundred-forty-second layer 150 is formed on the hundred-forty-second layer 132. A hundred-forty-third layer 142 is formed on the hundred-forty-third layer 150. A hundred-forty-fourth layer 132 is formed on the hundred-forty-fourth layer 142. A hundred-forty-fifth layer 150 is formed on the hundred-forty-fifth layer 132. A hundred-forty-sixth layer 142 is formed on the hundred-forty-sixth layer 150. A hundred-forty-seventh layer 132 is formed on the hundred-forty-seventh layer 142. A hundred-forty-eighth layer 150 is formed on the hundred-forty-eighth layer 132. A hundred-forty-ninth layer 142 is formed on the hundred-forty-ninth layer 150. A hundred-fiftieth layer 132 is formed on the hundred-fiftieth layer 142. A hundred-fifty-first layer 150 is formed on the hundred-fifty-first layer 132. A hundred-fifty-second layer 142 is formed on the hundred-fifty-second layer 150. A hundred-fifty-third layer 132 is formed on the hundred-fifty-third layer 142. A hundred-fifty-fourth layer 150 is formed on the hundred-fifty-fourth layer 132. A hundred-fifty-fifth layer 142 is formed on the hundred-fifty-fifth layer 150. A hundred-fifty-sixth layer 132 is formed on the hundred-fifty-sixth layer 142. A hundred-fifty-seventh layer 150 is formed on the hundred-fifty-seventh layer 132. A hundred-fifty-eighth layer 142 is formed on the hundred-fifty-eighth layer 150. A hundred-fifty-ninth layer 132 is formed on the hundred-fifty-ninth layer 142. A hundred-sixtieth layer 150 is formed on the hundred-sixtieth layer 132. A hundred-sixty-first layer 142 is formed on the hundred-sixty-first layer 150. A hundred-sixty-second layer 132 is formed on the hundred-sixty-second layer 142. A hundred-sixty-third layer 150 is formed on the hundred-sixty-third layer 132. A hundred-sixty-fourth layer 142 is formed on the hundred-sixty-fourth layer 150. A hundred-sixty-fifth layer 132 is formed on the hundred-sixty-fifth layer 142. A hundred-sixty-sixth layer 150 is formed on the hundred-sixty-sixth layer 132. A hundred-sixty-seventh layer 142 is formed on the hundred-sixty-seventh layer 150. A hundred-sixty-eighth layer 132 is formed on the hundred-sixty-eighth layer 142. A hundred-sixty-ninth layer 150 is formed on the hundred-sixty-ninth layer 132. A hundred-seventieth layer 142 is formed on the hundred-seventieth layer 150. A hundred-seventy-first layer 132 is formed on the hundred-seventy-first layer 142. A hundred-seventy-second layer 150 is formed on the hundred-seventy-second layer 132. A hundred-seventy-third layer 142 is formed on the hundred-seventy-third layer 150. A hundred-seventy-fourth layer 132 is formed on the hundred-seventy-fourth layer 142. A hundred-seventy-fifth layer 150 is formed on the hundred-seventy-fifth layer 132. A hundred-seventy-sixth layer 142 is formed on the hundred-seventy-sixth layer 150. A hundred-seventy-seventh layer 132 is formed on the hundred-seventy-seventh layer 142. A hundred-seventy-eighth layer 150 is formed on the hundred-seventy-eighth layer 132. A hundred-seventy-ninth layer

**FIG. 5**

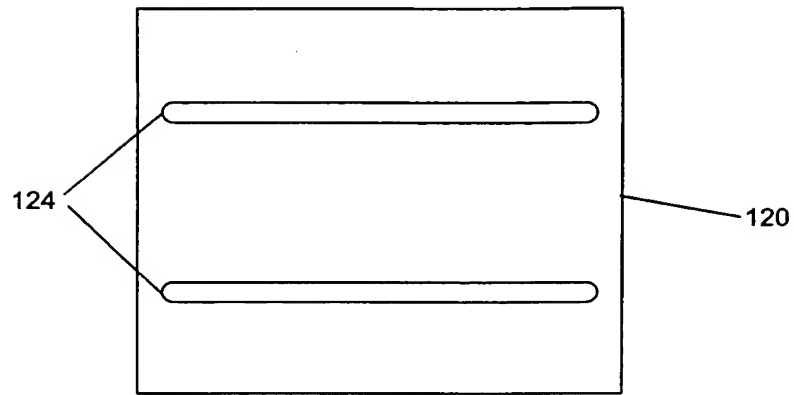


FIG. 6A

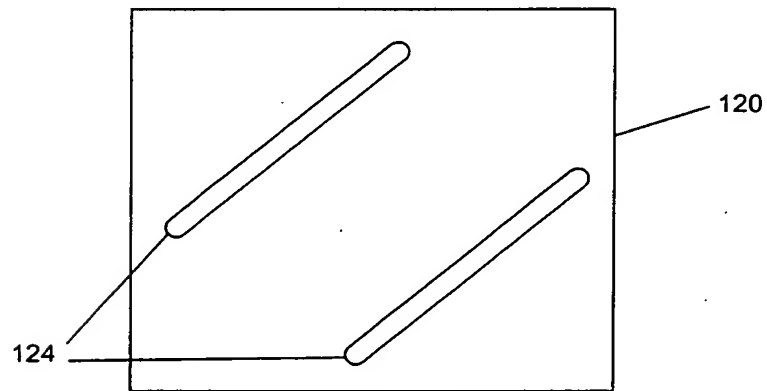


FIG. 6B

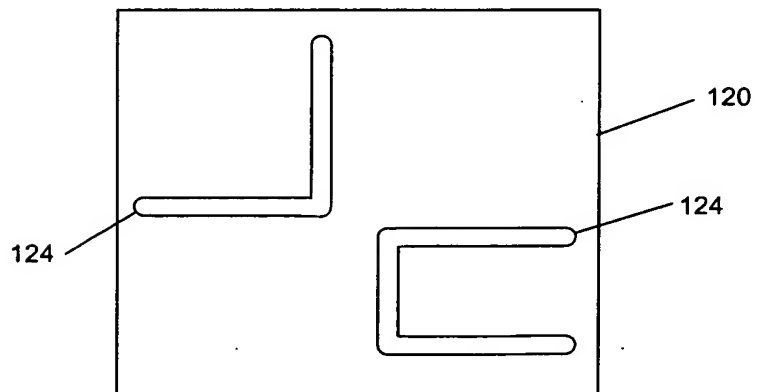


FIG. 6C